APPENDIX 14-20

BLM REPORT

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Moab District
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(U-065C)

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S.W. Falk
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IN REPLY REFER TO

DEC 11 1991

Mr. Daron R. Haddock
Permit Supervisor
State of Utah
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Dear Mr. Haddock:

The Bureau of Land Management (BLM) has been asked by Genwal Coal Company and the Manti-LaSal National Forest to comment on possible subsidence effects at the Crandall Canyon Mine. This request is a result of Genwal's application and subsequent revisions to add State coal leases ML-21568 and ML-21569 to the Mining and Reclamation Plan (MRP) for the Crandall Canyon Mine.

Genwal's MRP states that subsidence may occur over mining areas in the two state leases. The lateral extent of possible subsidence was estimated using a 30 degree angle of draw. Using that angle, the area of influence would extend across the boundary to National Forest lands. In the MRP, the maximum amount of vertical subsidence (the distance of ground movement) was estimated as 70 percent of the height of coal extracted with adjustments to unrecovered coal left in pillared areas. The draw angle and vertical subsidence estimates were based on empirical data from a number of sources. The BLM believes some of these estimates are inappropriate for the mining conditions in this area.

ANGLE OF DRAW

Draw angles of 30 degrees are very high for this region. Angles of this magnitude come in part from observations of mining in the eastern United States and in part from the National Coal Board in the United Kingdom. Coal beds in the Wasatch Plateau/Book Cliffs lie under normally deep cover where the upper strata consist of many massive and competent sandstone and siltstone members. These conditions appear to affect subsidence profiles in the region. Documented subsidence data from mining areas in the Wasatch Plateau show draw angles ranging from 15 to 20 degrees with the majority of the measured data closer to 15 degrees. These data came from mining company data and two independent studies from the Bureau of Mines. In our opinion, draw angles of 30 degrees do not apply to the Wasatch Plateau/Book Cliffs coal fields. Estimations of possible draw angles should be in the 15 to 20 degree range.

VERTICAL SUBSIDENCE ESTIMATION

The MRP projects the maximum surface extent and magnitude of possible subsidence on both the State coal leases and the surrounding lands of Federal surface and subsurface ownership. In our opinion, the scenario depicted in the MRP is worst possible case and should not happen. From available data taken from actual mining, subsidence from room and pillar mining is less than subsidence from longwall mining. Multiple panels mined by longwall methods tend to subside the surface in a more classical form consisting of lateral ground lowering without surface disruptions. This has been documented for longwall mining under deep overburden (1500+ feet). Vertical subsidence of 60 to 70 percent of the extracted seam height has been observed over large areas of mined out longwall panels. The strata above the mined out panels tends to bend elastically. This seems logical given the wide areas of these extracted panels. The only exceptions to this have been in areas near cliffs with highly jointed and fractured outcrop rock or areas of weakened strata from faults or burnt coal.

Subsidence under room and pillar panels behaves much differently. Where longwall panels extract coal quickly over wide areas, room and pillar panels take much longer to mine and are not as wide. Evidence shows that subsidence above room and pillar panels is much less than subsidence above longwall panels. Caving above room and pillar panels may be in the form of arches filling up with broken material displacing the void with this material before the arch reaches the surface. Case history backs this claim. Most of the mines in the region have been mining with some form of room and pillar methods for over 50 years with little documented subsidence. The room and pillar mines near Crandall Canyon (Huntington # 4 Mine, Trail Canyon Mine, Des-Bee-Dove Mine) have experienced minimal surface effects from mining. Again, significant subsidence effects have only been observed in areas of jointed cliffs or shallow cover with room and pillar mining.

Room and pillar mining results in partial seam extraction, whereas longwall mining results in a larger percentage of extraction. Barrier pillars are left between room and pillar panels which in Genwal's case are quite large due to the deep cover. It is a rarity that each pillar in the panel is completely removed; stumps and fenders are left. Overall recovery is usually not much more than 50 percent. Design equations found in rock mechanic books (Rock Mechanics and the Design of Structures in Rock, by Obert and Duvall, and Underground Mining Methods Handbook, by Hustrulid) demonstrate that overall strata failure may not occur with extraction rates of 50 percent or less.

With regard to Genwal's application, the BLM's opinion is that room and pillar mining should not subside the adjoining Federal surface given the depth of mining and planned amount of coal extraction. If subsidence does occur, we are confident that the only surface effects will be minimal ground lowering. Surface resources should not be impacted.

Sincerely yours,

Gary Johnson

for

Assistant District Manager
Mineral Resources

cc:
DM, Moab (U-065)
SD, Utah (U-921)
Manti LaSal National Forest
Genwal Coal Company